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N 536 - Utilization of Nursing Research in Advanced Practice, Summer 2008

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Research Design

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Design Characteristics

- Maximizes control over factors to increase the validity of the findings
- Guides the researcher in planning and implementing a study
Level of Control: Quantitative Research

- Descriptive
- Correlational
- Quasi-experimental
- Experimental

Increased Control with Design
Concepts Relevant to Research Design (1)

**Causality**

A \[\rightarrow\] B
Pressure \[\rightarrow\] Ulcer

**Multicausality**

Years smoking \[\rightarrow\] Heart disease
High fat diet \[\rightarrow\] Heart disease
Limited exercise \[\rightarrow\] Heart disease
Concepts Relevant to Research Design (2)

- Probability: Likelihood of an outcome
- Bias: Slanting findings
- Manipulation: Treatment
- Control: All phases of design
Design Validity

- Measure of accuracy of a study
- Examined with critique of the following dimensions:
  - Statistical conclusion validity
  - Internal validity
  - Construct validity
  - External validity
Elements of a Strong Research Design (1)

- Controlling the environment of the study setting

- Levels of controlling:
  - Natural setting
  - Partially controlled setting: e.g., clinics
  - Highly controlled setting: e.g., laboratory
Elements of a Strong Research Design (2)

- Controlling the equivalence of subjects and groups
  - Random subject selection
  - Random assignment to groups
Elements of a Strong Research Design (3)

- Controlling the treatment
  - Choose a treatment based on research and practice
  - Develop a protocol for implementation
  - Document the implemented treatment
  - Use a check-list to determine the extent of completeness to which the treatment was implemented
  - Evaluate the treatment during the study
Elements of a Strong Research Design (4)

• Controlling measurement
  o Reliability
  o Validity
  o Number of measurement methods
  o Types of instruments
Elements of a Strong Research Design (5)

- **Controlling extraneous variables**
  - Identify and eliminate extraneous variables via sample criteria, choice of settings, or research design
  - Random sampling
  - Sample: Heterogenous, homogeneous, or matching
  - Statistical control
Problems with Study Designs

- Inappropriate for the study purpose or the research framework
- Poorly developed designs
- The research methods were poorly implemented
- Inadequate treatment, sample, or measurement methods
Selecting a Design

Is there a treatment?

Yes

Is the treatment tightly controlled by the researcher?

No

Yes

Is the primary purpose examination of relationships?

No

Yes

Descriptive Design

Will the sample be studied as a single group?

No

Yes

Quasi-Experimental Study

Will a randomly assigned control group be used?

No

Yes

Is the original sample randomly selected?

No

Yes

Experimental Study

Correlational Design
Selecting a Descriptive Design

Examining sequences across time?

- Yes
  - Following same subjects across time?
    - Yes
      - Single unit of study
    - No
      - Studying events partitioned across time?
        - Yes
          - Longitudinal Study
        - No
          - Trend Analysis

- No
  - One Group?
    - Yes
      - Cross-sectional design
    - No
      - Comparative Descriptive Design

Research Design

Cross-sectional design with treatment partitioning
Longitudinal design with treatment partitioning
A Typical Descriptive Design

Clarification → Measurement → Description → Interpretation

Phenomenon of Interest

Variable 1

Variable 2

Variable 3

Variable 4

Description of Variable 1

Description of Variable 2

Description of Variable 3

Description of Variable 4

Interpretation of Meaning

Development of Hypotheses
A Comparative Descriptive Design

Group I {variables measured} → Describe → Comparison of Groups on Selected Variables → Interpretation of Meaning → Development of Hypotheses

Group II {variables measured} → Describe
Selecting the Type of Correlational Design

- **Describe relationships between/among variables?**
  - Descriptive correlational design

- **Predict relationships between/among variables?**
  - Predictive correlational design

- **Test theoretically proposed Relationships?**
  - Model testing design
A Descriptive Correlational Design

Measurement

Research Variable 1

Description of variable

Examination of Relationship

Interpretation of Meaning

Development of Hypotheses

Research Variable 2

Description of variable
A Predictive Design

Value of Intercept + Value of Independent Variable 1 + Value of Independent Variable 2 = Predicted Value of Dependent Variable
Selecting The Type of Quasi-Experimental Design

- Control Group?
  - No
    - Pretest?
      - No
        - One-group post-test only design
      - Yes
        - Repeated Measures?
          - No
            - Strategy for Comparison
              - No
                - Suggest Reevaluating design
              - Yes
                - Compare treatment & control conditions?
          - Yes
            - Repeated Measures?
Selecting The Type of Experimental Design

Pretest

No

Post-test only control group design

Yes

Repeated Measurements?

No

Examine effects of confounding variables?

No

Multiple sites?

Pretest/post-test control group design

Yes

Repeated measures design

Yes

Blocking?

No

Comparison of multiple levels of treatment

Yes

Randomized Block Design

Examination of complex relationships among variables in relation to treatment

Nested Designs
Pretest-Post Test, Control Group Designs

<table>
<thead>
<tr>
<th>Randomly selected experimental group</th>
<th>Randomly selected control group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement of dependent variables</td>
<td>Measurement of dependent variables</td>
</tr>
<tr>
<td>Manipulation of independent variables</td>
<td>Manipulation of independent variables</td>
</tr>
<tr>
<td>Randomly selected experimental group</td>
<td>Randomly selected control group</td>
</tr>
<tr>
<td>PRETEST</td>
<td>PRETEST</td>
</tr>
<tr>
<td>TREATMENT</td>
<td>POST-TEST</td>
</tr>
<tr>
<td>Treatment: Under control of researcher</td>
<td></td>
</tr>
</tbody>
</table>
| Findings: Comparison of pretest and post-test scores  
Comparison of experimental and control groups  
Comparison of pretest-post-test differences between samples |
Uncontrolled threats to validity: Testing  
Instrumentation  
Mortality  
Restricted generalizability as control increases |
# Post-Test-Only Control Group Design

<table>
<thead>
<tr>
<th>Randomly selected experimental group</th>
<th>TREATMENT</th>
<th>POST-TEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomly selected control group</td>
<td>POST-TEST</td>
<td></td>
</tr>
</tbody>
</table>

**Measurement of independent variables**

**Measurement of dependent variables**

**Treatment:** Under control of researcher

**Findings:** Comparison of experimental and control groups


**Uncontrolled threats to validity:**
- Instrumentation
- Mortality
- Limited generalizability as control increases
### Nested Design

#### Pain Control Management

<table>
<thead>
<tr>
<th>Traditional care</th>
<th>PRN Medication</th>
<th>New approach: “Around the clock” medication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit A</td>
<td>Unit B</td>
<td>Unit E</td>
</tr>
<tr>
<td>Unit C</td>
<td>Unit D</td>
<td>Unit F</td>
</tr>
<tr>
<td>Unit B</td>
<td></td>
<td>Unit G</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unit H</td>
</tr>
</tbody>
</table>

#### Primary Nursing Care

<table>
<thead>
<tr>
<th>Primary Care</th>
<th>No Primary Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit A</td>
<td>Unit B</td>
</tr>
<tr>
<td>Unit C</td>
<td>Unit D</td>
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</tr>
</tbody>
</table>

**Research Design**
Advantages of Experimental Designs

- More controls in design and conducting a study
- Increased internally validity
  - Decreased threats to design validity
- Fewer rival hypotheses
Advantages of Quasi-Experimental Designs

• More practical
  ○ Ease of implementation

• More feasible
  ○ Resources, subjects, time, setting

• More generalizable
  ○ Comparable to practice
Developing the Design Section of Your Proposal

- Identify the design
  - Name it specifically
- Provide a map of the design
- Discuss your rationale for using this design
- Describe threats to the validity of the chosen design